

E 94. (amended) The method of claim 92 wherein the method for forming each of at least ten of the materials further comprises sintering at a temperature ranging from 800 °C to about 1000 °C.

REMARKS

Claims 8, 10, 11, 15-24, 26, 30-35, 42, 43, 45-49, 51-56, 58-60, 64-72, 74-95 remain pending in the above-referenced patent application. Of these, claims 58, 59 and 79 are drawn to non-elected species, and have not been considered on the merits. Applicants respectfully request further consideration of these claims, in view of the amendments set forth above and the following remarks.

Amended Claims

A marked-up version of the amended claims showing the changes thereto is attached as Appendix A.

Claim 94 has been amended to claim a preferred embodiment of the invention. Support for this amendment can be found throughout the specification, including for example at page 50, lines 4-9, in Example C at page 70, line 32 through page 71, line 4, and in Example D at page 73, line 27 through page 74, line 1. No new matter has been added.

Acknowledgement

Applicants acknowledge that the Office action has withdrawn all of the previous rejections under 35 U.S.C. § 112 and 35 U.S.C. § 102, as well as the provisional double patenting rejections over copending applications U.S. Ser. No. 09/127,195 and 09/156,827.

Rejections Under 35 U.S.C. § 112, 1st Paragraph

Claims 92-95 have been rejected under 35 USC §112, 1st paragraph as containing new matter – that is, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that Applicants were in possession of the claimed invention. *See* paragraph 11 at pages 4-5 of the Office action.

This rejection is traversed with respect to claims 92, 93 and 95 in view of the following remarks. This rejection is obviated with respect to claim 94 in view of the amendments thereto, considered together with the following remarks.

Applicants respectfully submit that claims 92-95, as presently pending, are supported by the entirety of the specification as originally filed, and that a person of ordinary skill in the art would have recognized that Applicants were in possession of the inventions defined by these claims.

With respect to Claim 92, support can be found at page 50, lines 4-7, in particular when read in context with page 50, lines 16-17, to wit:

Traditional routes to solid-state synthesis involve the sintering of solid components. The standard method used to synthesize superconductors, for example, is to grind several metal-oxide powders together, compress the mixture and, thereafter, bake at a temperature ranging from 800 °C to about 1000 °C.... In contrast to such traditional routes, in the present invention, new routes to solid-synthesis focus on the synthesis of compounds at lower temperatures.

(emphasis added). Hence, a person of skill in the art would have appreciated that Applicants considered their invention to include annealing at a temperature less than the traditional sintering temperatures – that is, at a temperature of less than about 800 °C.

Claim 93 is unambiguously supported in Example C, at page 70, lines 25-32, which specifically teaches annealing for low-temperature diffusion using a temperature ranging from about 200 °C to about 300 °C. A skilled artisan would have understood that low-temperature annealing using this temperature range was one embodiment of Applicants' invention.

As noted above, support for as-amended claim 94 is found at page 50, lines 4-9, as well as in the various examples. In particular, the invention defined by this claim is exemplified by embodiments disclosed in Example C at page 70, line 32 through page 71, line 4, and in Example D at page 73, line 27 through page 74, line 1, each of which describes a process that includes low-temperature annealing (at less than 800 °C) followed by higher-temperature sintering (at more than 800 °C). As such, the specification would have conveyed to a person of skill in the art that Applicants' invention includes the sintering step as claimed.

Claim 95 is supported at page 34, lines 31-33, which discloses the recited film thickness range, especially when considered in connection with various examples. The invention defined by claim 95 is exemplified by embodiments disclosed in Example C at page 70, lines 30-32, and in Example D at page 72, line 18 through page 73, line 18 (including Table III), each of which describes a process that includes forming thin film layers of components with film thicknesses within the recited ranges. Hence, the specification would have conveyed that Applicants were in possession of the invention defined by claim 95.

Accordingly, Applicants submit that this basis for rejection should be withdrawn.

Rejections Under 35 U.S.C. §103(a) – Fister *et al.* in view of Cavicchi *et al.*

The Office action rejects each of the independent claims 42, 68, 70, 72, 74, 84 and 88, together with certain claims dependent therefrom (claims 8, 10, 11, 15-24, 26, 30-35, 43, 45-49, 51-56, 60, 64-67, 69, 71, 75-78 and 80-91)¹ as being obvious under 35 U.S.C. §103(a) over Fister *et al.* (1994) in view of U.S. Patent No. 5,365,756 to Cavicchi *et al.* (See paragraph 14 at pages 6-10 of the Office action).²

Applicants respectfully traverse this basis for rejection in view of the following remarks.

Each of the independent claims requires forming ten or more different inorganic materials on a substrate by a method that includes (i) delivering a first component of the material to the substrate to form a first solid layer comprising the first component on the

¹ Applicants note that there are no prior art rejections for claims 92-95.

² The Office action sets forth numerous conclusive statements regarding what Cavicchi *et al.* teaches with respect to various claimed aspects of the invention, and /or regarding what Applicants claims mean. Applicants expressly disagree with many of the statements asserted in the Office action in this regard. Some particular points of disagreement are discussed herein, to the extent necessary to distinguish the invention defined by the presently pending claims. Applicants have not, however, specifically addressed other particular points of disagreement, since such points are moot in view of the arguments set forth by Applicants. Applicants are not conceding the factual accuracy of any statements set forth in the Office action, except to the extent expressly admitted by Applicants. Applicants do not admit or acquiesce to statements in the Office action upon which Applicants have not commented.

substrate, (ii) delivering a second component of the material to the substrate to form a second solid layer comprising the second component on the first layer, and (ii) varying the composition, concentration, stoichiometry or thickness of the *delivered* (first or second) *component* between respective regions.

The Office action does not set forth a prima facie case of obviousness.

First, even if Fister *et al.* and Cavicchi *et al.* are, *arguendo*, considered in combination, they do not disclose or suggest several important features of Applicants' invention.

Significantly, for example, neither Fister *et al.* or Cavicchi *et al.* disclose or suggest preparing arrays of diverse materials using a protocol that includes varying the composition, concentration, stoichiometry or thickness of the *delivered* (first or second) *component*, as compared between respective material-containing regions – a step that is required by each of the claims defining the present invention. The Office action acknowledges that Fister *et al.* lacks any teaching or suggestion relating to the preparation of arrays of materials.³ Moreover, Cavicchi *et al.* does not make up for the deficiencies of Fister *et al.* with respect to this requirement. The shortcomings of Cavicchi *et al.* in this regard are already of record – as detailed in the previously-filed Amendment D, the relevant portions of which are hereby incorporated by reference.⁴

The references relied upon in this rejection do not disclose or suggest, and in fact teach away from, other required aspects of certain independent and/or dependent claims, including for example: allowing the delivered components to interact under a *common set of reaction conditions* (e.g., claim 72); forming an array of ten or more *composite materials* (e.g., claim 74); and varying the composition, concentration, stoichiometry or thickness of the delivered components *as a gradient* between respective material-containing regions (e.g., claim 84).

The law is clear that “to establish a *prima facie* case of obviousness, all the claim limitations must be taught or suggested by the prior art.” See MPEP Sec. 2143.03; *In re*

³ See paragraph 14 at page 8 of the Office action.

⁴ See pages 17-23 of Amendment D, and especially, page 18 (second full paragraph) through page 22 (first full paragraph).

Royka, 180 USPQ 580 (CCPA 1974). As noted above, however, technically and commercially significant features of the presently-claimed inventions are not taught or suggested by the prior art relied upon in the Office action. Accordingly, the Office action does not establish obviousness.

Additionally, and independent of the aforementioned reasons, *prima facie* obviousness is not established because the Office action does not demonstrate motivation existing in the art that would have led a skilled artisan to combine the teaching of the references in a manner that would have led to the claimed inventions.

A person of ordinary skill, considering the Cavicchi *et al.* reference as a whole, would have understood that the central teaching thereof as relating to a device for varying specific process conditions – temperature and /or voltage bias, as compared between various regions of the substrate. As such, even if Cavicchi *et al.* could have been considered, *arguendo*, to teach the formation of arrays comprising different materials by applying variations in temperature and/or voltage conditions, such disclosure would not have led a person of ordinary skill to Applicants' invention. The inventions defined by the presently-pending claims require that one or more of the delivered components are varied with respect to composition, concentration, stoichiometry or thickness as compared between regions. Proactively varying the composition, concentration, stoichiometry or thickness of the delivered components as required by the present invention – rather than varying the particular process parameters as taught by Cavicchi *et al.* – results in substantial benefits for materials discovery research. Briefly, for materials discovery research, both chemical diversity (*e.g.*, composition) and physical diversity (*e.g.* grain size) can be of substantial importance with respect to effecting commercially-important changes in material properties. Significantly, a substantially larger scope of chemical diversity can be achieved by varying the delivered components (*e.g.* with respect to composition, *etc.*) as taught by Applicants – as compared to that which could be achieved by varying temperature and/or voltage bias as disclosed by Cavicchi *et al.* Hence, the presently claimed methods differ substantially from the protocols disclosed by Cavicchi *et al.*, and offer substantial advantages that were not contemplated by the art relied upon in the Office action.

The Office action posits, nonetheless, that a person of skill in the art would have been motivated to combine and extend the teachings of Fister *et al.* with those of Cavicchi *et al.* based on

the “unique properties” of Fister *et al.*, the use of such to prepare new compounds and also the need to have *diversity of materials* to screen for desired properties and the advantages of the methods of Cavicchi *et al.* (“the ability to simultaneously *process* hundreds of microsamples *with a range of temperature parameters* would greatly enhance the optimization of the *processes*” and that the “ability to examine many microsamples in delicate micro-probing instruments... would speed the *development process*”... .

See paragraph 14 at page 10 of the Office action (citing Cavicchi *et al.* at Col. 14, lines 9-16) (emphasis added).

The asserted teaching of Cavicchi *et al.* – the desirability of having diversity of materials for property screening – appears to be misdirected or, at best, is too general to motivate a skilled artisan to arrive at the specific invention defined by the claims at issue. See *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Dow Chemical Co.*, 5 USPQ2d 1529 (Fed. Cir. 1988); *In re Geiger*, 2 USPQ2d 1276 (Fed. Cir. 1987). When the teachings of Cavicchi *et al.* are considered in the context of the entire reference – as required under the law, the reference would not have led to the claimed inventions. Specifically, Cavicchi *et al.* does not teach or suggest the desirability of pursuing the extent of chemical diversity effected by the presently-claimed methods. In fact, even the cited portion of Cavicchi *et al.* relied upon as establishing motivation makes it abundantly clear that Cavicchi *et al.* contemplates “diversity of materials” only to the extent that such diversity is effected by varying temperature or voltage – specifically-taught process parameters.⁵ The quoted portion regarding speeding

⁵ The Office action assertion that Cavicchi *et al.* teaches “gas phase reactants to alter the stoichiometry [*sic*: of] the materials” (See paragraph 14 at page 9 of the Office action, citing the Abstract) appears to be relied on in isolation, and out of context from both the Abstract and specification as a whole. As disclosed in context, the Cavicchi *et al.* Abstract clearly articulates that “(m)aterials are deposited onto *pixels with individually controlled deposition conditions (pixel temperature and bias)*. Pixels are also addressed *to control properties [sic: temperature and bias] during post-deposition processing steps* such as heating in vacuum or various gases to alter stoichiometry of a *single material*... .” Hence, in context, this teaching amounts only to

“development process” would likewise have been understood, in context, as referring to process development – not a broad-based compositional investigation. In fact, in this regard, Cavicchi *et al.* would have led away from Applicants’ invention, as specifically defined in the presently-pending claims.

Accordingly, the Office action does not adequately explain *why* a person of ordinary skill in the art would have been motivated to extrapolate beyond the teachings of both Fister *et al.* and Cavicchi *et al.* toward a set of protocols that are markedly distinguished from the approach taught by those references.

Applicants also note that the Office action does not adequately explain *why* the cited portion of the Cavicchi *et al.* reference would have led a person of skill in the art to combine the methods actually taught by Cavicchi *et al.* (varying temperature and/or voltage bias) with those taught by Fister *et al.* (synthesis of solid state materials using superlattices) (*See, e.g.*, claim 88).

In summary, the general motivation asserted in the Office action does not lead to the combination of the Fister *et al.* and Cavicchi *et al.* references, and significantly, does not lead to the substantially different methods claimed by Applicants. In view of the repeated warnings by the Federal Circuit against improper hindsight reconstruction (*i.e.*, against finding the required motivation in the guidance of the instant specification), the inventions defined by these claims cannot be considered to be obvious. *See, for example, In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicants’ concede that certain claimed method embodiments could be practiced using a device allowing for process variations – such as that disclosed in Cavicchi *et al.* However, obviousness cannot be established based merely on the fact that the device disclosed in the Cavicchi *et al.* reference could have been used, combined or modified as claimed in Applicants’ invention, unless the prior art also suggests the desirability of the combination. *In re Mills*, 16 USPQ2d 1430 (Fed. Cir. 1990).

varying the stoichiometry of individual materials by varying the pixel temperature and bias associated therewith.

Moreover, Applicants' respectfully assert that a skilled artisan would not have been motivated to modify the approach taught by Cavicchi *et al.* using protocols that are explicitly contrary to such approach. It is well settled in the law that no suggestion or motivation can be established for proposed modifications to a prior art embodiment, where such modifications would render the prior art embodiment unsuitable or unsatisfactory for its intended purpose. *See* MPEP 2143.02; *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984). In the present case, for example, a skilled artisan would not have been motivated to modify the central approach taught by Cavicchi *et al.* – varying temperature and/or voltage bias (or at best, other process conditions) in a manner that would have led to Applicants' invention as defined by claims requiring that the materials deposited on an array are allowed to interact under a *common set of reaction conditions* (e.g., claim 72). Such protocols would have defeated the intended purpose of the Cavicchi *et al.* device and methodology.

Hence, the Office action does not establish that the inventions defined by the presently-pending claims would have been *prima facie* obvious.

Provisional Obviousness-Type Double Patenting Rejections

Each of the considered claims have been rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over various claims of, independently, U.S. Patent No. 5,985,356 to Schultz *et al.*, and U.S. Patent No. 6,004,617 to Schultz *et al.* (*See* paragraphs 8 and 9 at pages 4-5 of the Office action).

Applicants will consider submitting a terminal disclaimer with respect to obviate each of these rejections, if necessary, once substantive agreement on the merits is reached.

Equivalents

The amendments to the claims and the arguments presented in response to the Office action have been made to claim subject matter which the Applicants regard as their invention. By such amendments, the Applicants in no way intend to surrender any range of equivalents beyond that which is needed to patentably distinguish the claimed invention as a whole over the prior art. Applicants expressly reserve patent coverage to all such equivalents that may fall

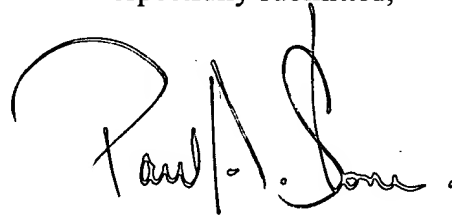
in the range between applicants literal claim recitations and those combinations that would have been obvious in view of the prior art.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

Applicants believe that no further fees are required in connection with the instant Amendment E. The Examiner is hereby authorized, however, to charge any necessary and proper fees required in connection with this application, or to credit any refund in connection therewith, to Deposit Account No. 50-0496.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Paul A. Stone", with a large, sweeping initial "P" and "S".

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APPENDIX A

MARKED UP VERSION INDICATING AMENDMENTS TO THE SPECIFICATION AND
CLAIMS, AND INDICATING NEW OR CANCELLED CLAIMS

IN THE CLAIMS

***Changes to the previously-pending claims are as follows:

94. (amended) The method of claim 92 wherein the method for forming each of at least ten of the materials further comprises sintering at a temperature ranging from [of about] 800 °C to about 1000 °C [or more].